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Experiment Station

ARTIFICIAL REARING OF 10 SPECIES OF WOOD-BORING INSECTS

Abstract.—Small numbers of 10 species of wood-boring insects were reared from newly hatched larvae to adults on artificial media with good survival. Species with life cycles of up to 2 years in nature were reared on the media in less than 1 year. Although all of the adults appeared normal physically, some were sterile. One species was reared artificially for three generations. Survival figures and the developmental periods of the larval stages are given.

Lack of suitable rearing techniques has hampered research on the biology and control of many species of wood-boring insects injurious to forest and shade trees. This is especially true for those species with extended life cycles that appear as adults only briefly in the field annually, biannually, or less often.

Recent work has shown that some wood-boring insects can be continuously reared artificially. Wollerman, Adams, and Heaton (1969) reared the locust borer, *Megacyllene robiniae* (Forster), continuously on artificial media for several generations. Smith *(1965)* reported rearing the peach tree borer, *Sanninoidea exitiosa* (Say), on immature apples. Solomon (*1966*) was able to successfully rear the carpenterworm, *Prionoxystus robiniae* (Peck), on artificial media; and Harley and Willson *(1968)*

reported artificial rearing of a cerambycid borer, *Plagiohammus spinipennis* Thomson.

This note is a report on artificially rearing small numbers of 10 species of insects that breed in the inner bark or wood of dead, dying, or living trees.

Materials and Methods

Adult beetles used for oviposition were obtained in the following manner. *Neoclytus caprea* Say, which were overwintering as adults just beneath the bark of white ash logs (*Fraxinus americana* L.) were carefully pulled from their tunnels with forceps. The rustic borer, *Xylotrechus colonus* (F.); red-headed ash borer, *Neoclytus acuminatus* (F.); painted hickory borer, *Megacyllene caryae* (Gahan); hackberry engraver, *Scolytus muticus* Say; and *Chion cinctus* (Drury) were collected during the summer months from outdoor emergence cages containing logs of *Ulmus americana* L., *Gleditsia tricanthos* L., and *Carya* species. Locust borer adults, *Megacyllene robiniae* (Forster), were collected in late summer on goldenrod flowers.

Adults of the cerambycid species, with the exception of *C. cinctus,* readily mated and oviposited eggs under ½-inch black bias type wrapped in a spiral around fresh 1 by 8 inch bolts of wood of their host species. *C. cinctus* produced only a small number of eggs. This technique was reported previously by Wollerman *et al. (1969).* After oviposition occurred, the bias tape was removed and placed along with the bolts of wood in uncovered ½-gallon ice cream cartons until the eggs hatched and the larvae dropped to the bottom of the carton.

Adults of *S. muticus* were placed on freshly-cut honeylocust bolts approximately 5 by 12 inches. At the end of nine days, the eggs were carefully dissected from the egg galleries and held in a petri dish until they hatched.

Orthotomicus caelatus (Eichhoff) beetles were found attacking dying white pine (*Pinus strobus* L.), and *Leperisinus aculeatus* Say were found in late spring attacking logs and branches of freshly cut white ash. Eggs of these species were dissected from field-collected wood and were held on moistened filter paper in a petri dish sealed with masking tape until hatched.

Eggs of *Romaleum rufulum* (Hold.) were provided by C. John Hay, insect ecologist at our Laboratory at Delaware, Ohio.

Newly hatched larvae of the various species were placed in one of two

artificial media, except *M. robiniae* larvae, which were reared in both media. The number of newly hatched larvae placed in the media, number of days to adult emergence, and number of adult yield were recorded (table 1).

Table 1.—Species reared and rearing data

Species	Number of newly hatched larvae introduced to media		Number and days to adult emergence			Number and percent of adult yield	
	Medium A	*Medium B*	*Min.*	*Max.*	*Aver.*	*No.*	*Pct.*
Neoclytus caprea Say	40	—	78	103	92	32	80
N. acuminatus (F.)	36	—	37	53	49	34	94
Megacyllene caryae (Gahan)	45	—	52	81	68	40	89
M. robiniae (Forster)	25	—	51	78	60	20	80
M. robiniae (Forster)	—	31	52	63	59	28	90
Orthotomicus caelatus (Eichh.)	14	—	18	24	20	8	57
Romaleum rufulum (Hold.)	—	5	129	249	205	4	80
Scolytus muticus Say	29	—	25	37	29	21	72
Leperisinus aculeatus Say	19	—	21	32	25	11	58
Chion cinctus (Drury)	2	—	214	([1])	—	1	50
Xylotrechus colonus (F.)	—	44	38	57	47	41	93

[1] 1 larva died without establishing in the medium, so data are for 1 larva only.

The artificial media (table 2), media preparation, rearing containers, and techniques used in this study were similar to those reported by Galford (1967 and 1969[1]). The media had been pressed to a moisture content of 50 to 55 percent. Holes just large enough to accommodate the larvae were made in the media with a dissecting needle, and the larvae were transferred with a small brush.

Scolytid species were reared to adults in the glass plate rearing devices, while larvae of the cerambycid species were started in the glass plate rearing devices and transferred to 60 x 15-mm plastic petri dishes full of unpressed media at the end of 3 to 4 weeks. The ceramycid larvae were transferred to fresh media at monthly intervals until they pupated. All rearing was conducted in darkened cabinets at 30±2°C and 50±20 percent relative humidity.

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[1] Galford, Jimmy R. A LARVAL AND OVIPOSITIONAL MEDIUM FOR SCOLYTUS MULTISTRIATUS. (Accepted for publication in the J. Econ. Entomol.)

Table 2.—Artificial media formulas

Constituent	Medium A	Medium B
	Grams	*Grams*
Agar	32.00	32
Sucrose	16.00	—
Fructose	8.00	—
Glucose	8.00	—
Vitamin diet fortification mixture	12.00	—
Brewer's yeast[1]	40.00	—
Soybean protein	16.00	—
Wesson's salt mixture	20.00	—
Cholesterol	.80	—
Kretschmer wheat germ[1]	20.00	120
Vegetable lecithin	.80	—
Vitamin Bt	.08	—
Sorbic acid	2.00	2.00
Methylparaben	1.00	1.00
Alphacel (hydrolyzed)[1]	320.00	280
	ml.	*ml.*
Wheat germ oil	4.00	—
Water	800.00	800.00

[1] Mention of specific brand products does not imply their endorsement by the USDA.

Results and Discussion

In some cases very small numbers of newly hatched larvae were reared because of the lack of eggs (table 1). The large amounts of media consumed by some of the cerambycids in the later instars, and necessity of transferring some larvae several times, prevented rearing more than a few larvae of each species. It is noteworthy, however, that survival was excellent, especially for the cerambycid species. The very small and easily injured nature of scolytid larvae probably accounted for their lower survival figures. In all cases the adults that emerged from the media were normal in physical appearances and capable of flight. The *M. robiniae* adults reared on medium B were slightly smaller than the average field-collected beetle, but were otherwise physically normal.

The scolytid adults produced normal egg galleries and offspring when confined with bolts of wood of their host trees. However, only two species of cerambycids, *X. colonus* and *M. robiniae,* laid viable eggs. The cause of infertility of some of the cerambycids was not investigated, but the medium-reared females of *M. caryae* produced many viable eggs when mated with field-collected males, which suggests that the males of *M. caryae* reared on the artificial medium were sterile. Three generations of *M. robiniae* were reared on medium B without any apparent decline in the vigor of the beetles.

To sum up: Many species of wood-boring insects can be reared artificially with good survival. Species with life cycles of up to 2 years in nature can be reared on the media in less than 1 year. Although the artificially reared adults appear physically normal, the infertility of many of the species must be investigated before continuous rearing can be successful.

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— JIMMY R. GALFORD
Research Entomologist
Forest Insect and Disease Laboratory
Northeastern Forest Experiment Station
Forest Service, U.S. Dep. Agriculture
Delaware, Ohio